

Claims

1. A method of determining the cetane number of fuel in an internal combustion engine, comprising:

performing fuel injection for cetane number determination in which a
5 specified quantity of fuel is injected into a combustion chamber during a compression stroke or a expansion stroke while the internal combustion engine is in a fuel cut state; and

determining the cetane number of the fuel based on a time period from a specified time to a time of ignition at which the fuel injected by the fuel injection for
10 cetane number determination is ignited.

2. A method of determining the cetane number of fuel in an internal combustion engine according to claim 1 further comprising:

deriving a generated heat quantity parameter having a correlation with a
15 quantity of heat generated in the combustion chamber of said internal combustion engine,

wherein said time of ignition is set to a time at which said generated heat quantity parameter starts to increase on condition that an increase in said generated heat quantity parameter after performing said fuel injection for cetane
20 number determination is larger than or equal to a specified increase amount.

3. A method of determining the cetane number of fuel in an internal combustion engine comprising:

deriving a generated heat quantity parameter having a correlation with a
25 quantity of heat generated in a combustion chamber of an internal combustion

engine,

performing fuel injection for cetane number determination in which a specified quantity of fuel is injected into a combustion chamber during a compression stroke or a expansion stroke while the internal combustion engine is

5 in a fuel cut state; and

determining the cetane number of the fuel based on a rate of increase in said generated heat quantity parameter upon ignition of the fuel injected by the fuel injection for cetane number determination.

10 4. A method of determining the cetane number of fuel in an internal combustion engine according to claim 2 or 3, wherein in the case in which said generated heat quantity parameter is derived based on an output value of a sensor that detects a physical quantity that changes with a change in a quantity of heat generated in said combustion chamber, said specified fuel quantity is such an
15 quantity that a change in the torque of the internal combustion engine upon combustion of the specified quantity of fuel falls within an allowable range, and that the peak value of an increase in said generated heat quantity parameter upon ignition of the specified quantity of fuel in said combustion chamber is larger than the peak value of an increase in said generated heat quantity parameter that is
20 derived while fuel is not burned in said combustion chamber, caused by noise in the output value of said sensor.

5 5. A method of determining the cetane number of fuel in an internal combustion engine according to claim 1 or 3, wherein timing of performing said
25 fuel injection for cetane number determination is set in such a way that the fuel

injected by the fuel injection for cetane number determination is ignited in the latter half of the expansion stroke.

6. A method of determining the cetane number of fuel in an internal
5 combustion engine according to claim 1 or 3, wherein when said fuel injection for cetane number determination is to be performed, the quantity of intake air flowing into said combustion chamber is reduced to smaller than or equal to a specified intake air quantity.

10 7. A method of determining the cetane number of fuel in an internal combustion engine according to claim 1 or 3, wherein said fuel injection for cetane number determination is performed after a specified time has elapsed since fuel cut was effected in said internal combustion engine.

15 8. A method of determining the cetane number of fuel in an internal combustion engine according to claim 1 or 3, wherein said internal combustion engine comprises a plurality of cylinders, and the cetane number of fuel is determined by performing said fuel injection for cetane number determination only in any one of the cylinders.

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9. A method of determining the cetane number of fuel in an internal combustion engine according to claim 2 or 3, wherein said internal combustion engine further comprises pressure detection means for detecting the pressure in said combustion chamber and volume detection means for detecting the volume of
25 said combustion chamber, wherein said generated heat quantity parameter is

derived based on the pressure P in said combustion chamber detected by said pressure detection means and the volume V of the combustion chamber detected by said volume detection means.

5 10. A method of determining the cetane number of fuel in an internal combustion engine according to claim 9, wherein said generated heat quantity parameter is PV^{κ} , which represents the product of the pressure P in said combustion chamber detected by said pressure detection means and the κ -th power of the volume V of said combustion chamber detected by said volume
10 detection means.

 11. A method of determining the cetane number of fuel in an internal combustion engine according to claim 9, wherein said generated heat quantity parameter is ΔPV , which represents a value obtained by subtracting the product of
15 the pressure P' in said combustion chamber and the volume V' of said combustion chamber in the case in which the piston only moves without combustion occurring in the combustion chamber from the product of the pressure P in said combustion chamber detected by said pressure detection means and the volume V of said combustion chamber detected by said volume detection means at the same crank
20 angle.